



Expert Elicitation

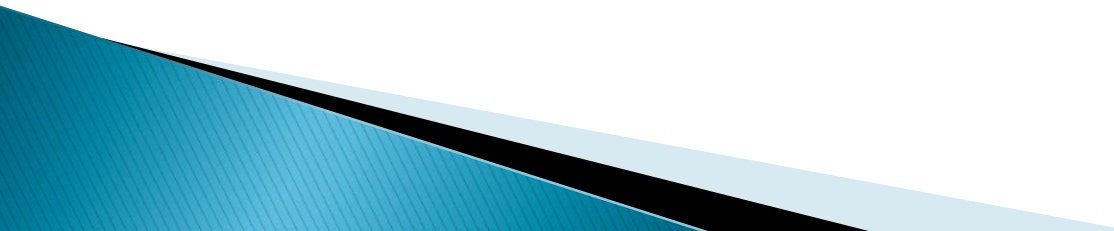
Jennie Hoffman
EcoAdapt

Situation:

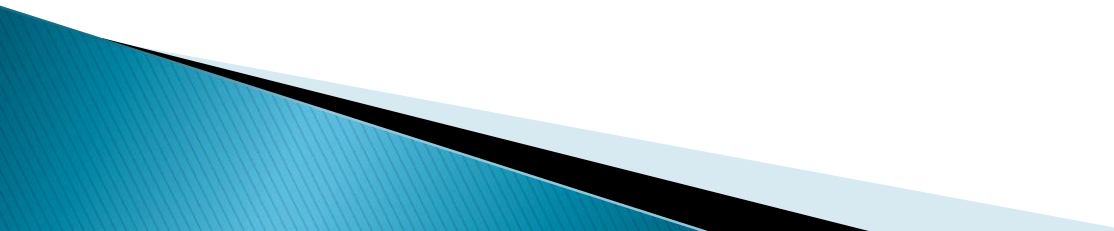
- ▶ You have incomplete or inadequate data
- ▶ You're unsure of which models to use or how to parameterize them
- ▶ There are all kinds of other uncertainties
- ▶ You need to make a decision anyway



Expert elicitation to the rescue!

- ▶ Good for informing decision-making when:
 - Empirical data are missing or incomplete
 - Uncertainties are large
 - More than one conceptual model can explain existing data
 - Technical judgments are needed to evaluate assumptions
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Other benefits

- ▶ Can take advantage of integrated and contextual knowledge and understanding
 - ▶ Generates buy-in, ownership
 - ▶ Can be rapid, relatively low cost
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History

- ▶ Legally defensible examples
 - ESA: listing species and critical habitat designation
 - CERCLA: ecological risk assessment
 - NRDA: injuries to resources
- ▶ Not necessarily legal-quality examples
 - State-level: identifying habitat acquisitions
 - Developing adaptation options

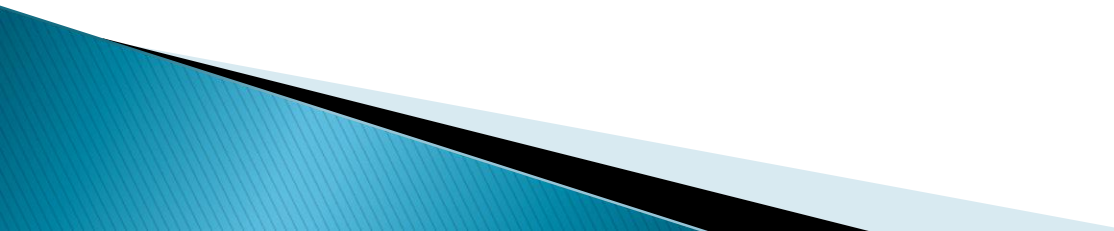
A few cautions

- ▶ If you're trying to quantify subjective judgment, you need a solid process
 - ▶ Cutting corners leads to shoddy results
 - ▶ Beware expert overconfidence and other common errors made by experts
 - ▶ Won't solve political or value-dependent problems
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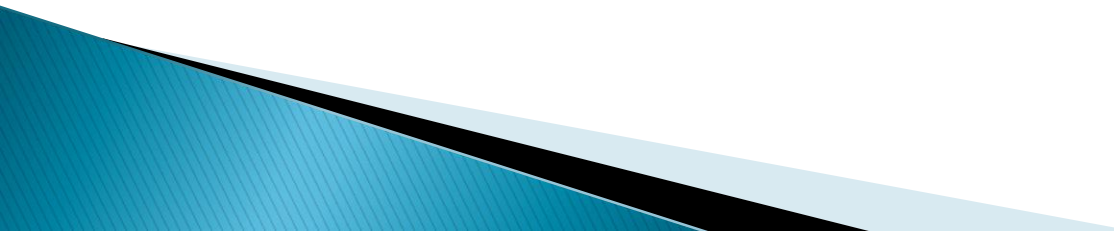
General approach

- ▶ Pre-elicitation:
 - Define problem
 - Structure problem/question
 - ID and select experts
 - Develop protocol
 - Develop briefing book
- ▶ Elicitation (Individual or group)
 - Motivate and train experts
 - Encode judgments
 - Verify judgments
- ▶ Post-elicitation
 - Document it all

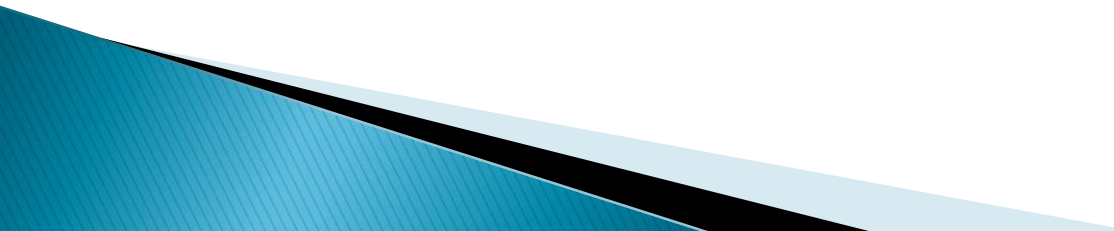
Climate change example: NEAFWA

- ▶ Northeast Association of Fish and Wildlife Agencies Regional Habitat Model
 - ▶ Objective: map geographical variation in habitat vulnerability across 13 NE States
 - ▶ Combined EE with formal modeling
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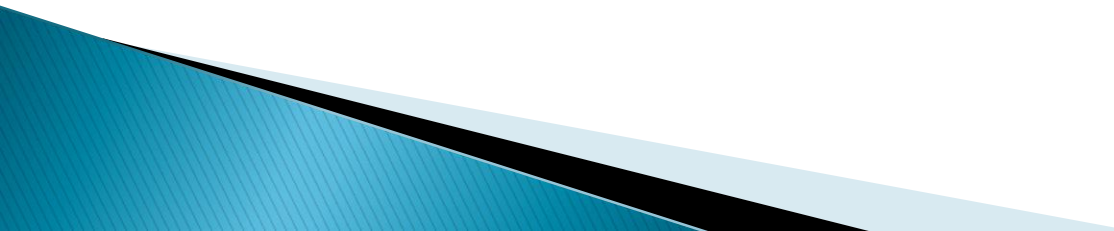
NEAFWA model

- ▶ Six major elements
 - Assessment of vulnerability to climate change
 - Assessment of vulnerability to non-climate stressors
 - Interaction potential
 - Assessment of overall future vulnerability
 - Confidence evaluation
 - Narratives
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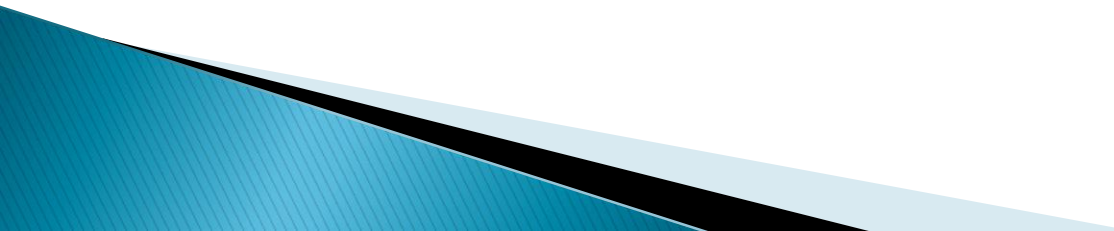
NEAFWA process: panel formation

- ▶ 40 participants from states, feds, and NGOs
 - ▶ Wildlife biologists, ecologists, habitat specialists, regulators
 - ▶ Given education in likely future climates in NE, how species/systems already reacting
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NEAFWA process: panel tasks

- ▶ Review and comment on draft model
 - ▶ Help finalize model
 - ▶ Participate in habitat work groups
 - ▶ Review and critique model runs from Manomet
 - ▶ Help produce consensus habitat VAs
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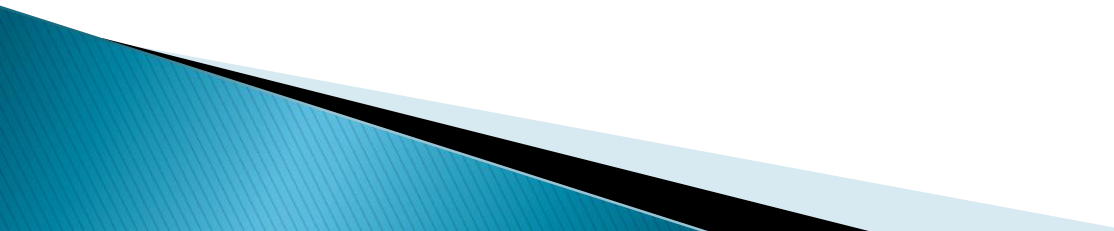
Climate change example: Climate Ready Estuaries “EE-type exercise”

- ▶ Piloted in two locations: SF Bay, MA Bay
 - ▶ Wanted qualitative judgments on:
 - Relative influences of physical and ecological variables that regulate key climate-sensitive processes
 - Sensitivities of influences under current and future climate change scenarios
 - Degree of confidence in judgments about relationships
 - Options for adaptation
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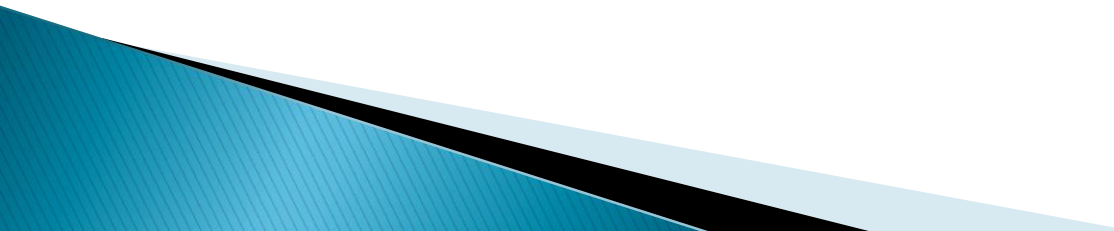
Characterizing influences

- ▶ How well do we *understand* each influence?
 - Influence Types: Direct or Inverse
 - Influence Degrees: Proportional or Disproportional
 - ▶ How *sensitive* is each influence?
 - Low Sensitivity: Disproportionately Weak Response
 - Medium Sensitivity: Proportionate Response
 - High Sensitivity: Disproportionately Strong Response
 - ▶ What influences have the greatest relative impact on the endpoint? (*importance*)
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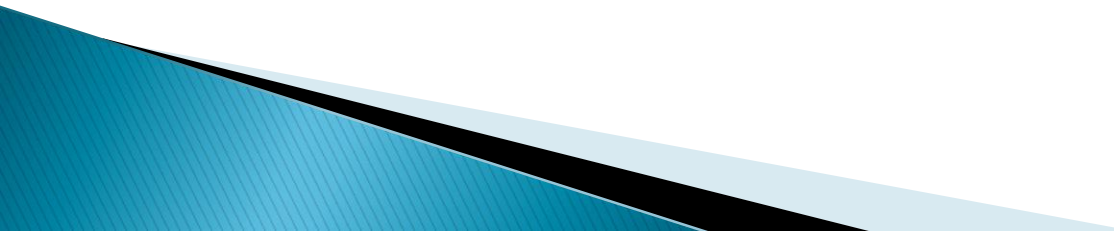
CRE Process: panel formation

- ▶ Created 2 expert panels for each site:
 - community interactions group
 - sediment retention group
 - ▶ 7 experts each, mix of academia, NGOs, feds
 - ▶ Elicited opinions in a 2-day workshop
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CRE Process: panel tasks

- ▶ Individually evaluate “straw dog” influence diagrams showing key process variables, interrelationships (influences)
 - characterized type, sensitivity of each influence
 - ▶ Discuss as group, generated “consensus” diagrams
 - ▶ ID most likely management options
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CRE Conclusions

- ▶ Look at all types of information when analyzing management paths: influences, sensitivity, importance
 - ▶ Based on expert judgment, can ID “top pathways” for which there are available adaptation options.
 - ▶ Variation between participants was greater than between scenarios
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“The process of expert elicitation must never be approached as a routine procedure amenable to cookbook solutions ... Each elicitation problem should be considered a special case and be dealt with carefully on its own terms.”

Morgan and Henrion 1990

And yet ...

Commonalities

- ▶ Capture expert assumptions, thought process
 - NEAFWA: Excel model
 - CRE: influence diagrams
 - ▶ Evaluate confidence
 - NEAFWA: condensed 5–point IPCC scale to 3
 - CRE: reflect agreement and availability of evidence
 - ▶ Focus on transparency
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